

What is claimed is:

1. A method for determining number of a frame in a sequence of two or more frames, the method comprising:

receiving a sequence of at least $M+1$ consecutive OFDM frames, each frame having an index m , having a designated preamble and having a selected length $N1$ and an associated pseudo-noise signal $PN(t;m)$ ($m = 0, \dots, M; M \geq 1$);

providing an overlap function $OF(m;k)$ of the designated preambles with each of a sequence of selected reference signals, indexed by $k = 1, 2, \dots, K$ where K is a selected integer, and determining a phase $\phi(m)$ corresponding to a location of a maximum amplitude of the overlap functions $OF(m;k)$ for each of the $M+1$ designated preambles;

forming a selected M th order phase difference of the phases $\phi(m)$; and

comparing the M th order difference with a selected table of M th order phase differences to determine a frame number of at least one of the $M+1$ frames.

2. The method of claim 1, further comprising choosing $M = 1$ and choosing said first-order phase difference to be $\Delta_1(m) = \phi(m+1) - \phi(m)$.

3. The method of claim 1, further comprising choosing $M = 3$ and choosing said first-order phase difference to be $\Delta_3(m) = \phi(m+3) - 3\phi(m+2) + 3\phi(m+1) - \phi(m)$.

4. The method of claim 1, further comprising choosing M to be an odd integer.

5. The method of claim 1, further comprising forming a linear combination

$$LC(m) = \sum_{p=1}^P c(p) \cdot \Delta_p(m) \quad (P \geq 2),$$

where $c(p)$ are selected coefficients, at least one of which is non-zero; and
 comparing the linear combination value $LC(m)$ with a selected table of linear combination values to determine a frame number of at least one of the $M+1$ frames.

6. The method of claim 1, further comprising providing at least two of said pseudo-noise signals, $PN(t;m1)$ and $PN(t;m2)$, as translations of each other through a relation $PN(t;m2) = PN(t + \Delta t(m1,m2);m1)$, where $\Delta t(m1,m2)$ is a selected time difference depending upon at least one of said indices $m1$ and $m2$.

7. The method of claim 1, further comprising:
 computing a first order sum $\sum_1(m) = \phi(m+1) + \phi(m)$ for at least one index number m ; and
 when the sum $\sum_1(m)$ is not equal to at least one of the numbers $+1$ and -1 , adjusting a value of at least said phases $\phi(m)$ and $\phi(m+1)$ so that the sum $\sum_1(m)$ is equal to one of the numbers $+1$ and -1 .

8. The method of claim 1, further comprising choosing at least one of said selected reference signals to be an m -sequence.

9. A system for determining number of a frame in a sequence of two or more frames, the system comprising a computer that is programmed:

to receive a sequence of at least $M+1$ consecutive OFDM frames, each frame having an index m , having a designated preamble and having a selected length $N1$ and an associated pseudo-noise signal $PN(t;m)$ ($m = 0, \dots, M$; $M \geq 1$);

to provide an overlap function $OF(m;k)$ of the designated preambles with each of a sequence of selected reference signals, indexed by $k = 1, 2, \dots, K$ where K is a selected integer, and to determine a phase $\phi(m)$ corresponding to a location of a maximum amplitude of the overlap functions $OF(m;k)$ for each of the $M+1$ designated preambles;

to form a selected Mth order phase difference of the phases $\phi(m)$; and
to compare the Mth order difference with a selected table of Mth order
phase differences to determine a frame number of at least one of the M+1 frames.

10. The system of claim 9, wherein said integer M is chosen equal to 1 and
said first-order phase difference is chosen to be $\Delta_1(m) = \phi(m+1) - \phi(m)$.

11. The system of claim 9, wherein said integer M is chosen to be 3 and
said first-order phase difference is chosen to be $\Delta_3(m) = \phi(m+3) - 3\phi(m+2) +$
 $3\phi(m+1) - \phi(m)$.

12. The system of claim 9, wherein said integer M is chosen to be an odd
integer.

13. The system of claim 9, wherein said computer is further programmed:
to form a linear combination

$$LC(m) = \sum_{p=2}^P c(p) \cdot \Delta_p(m) \quad (P \geq 2),$$

where $c(p)$ are selected coefficients, at least one of which is non-zero; and

to compare the linear combination value $LC(m)$ with a selected table of
linear combination values to determine a frame number of at least one of the
M+1 frames.

14. The system of claim 9, wherein said computer is further programmed
to provide at least two of said pseudo-noise signals, $PN(t;m1)$ and $PN(t;m2)$, as
translations of each other through a relation $PN(t;m2) = PN(t + \Delta t(m1,m2);m1)$,
where $\Delta t(m1,m2)$ is a selected time difference depending upon at least one of said
indices $m1$ and $m2$.

15. The system of claim 9, wherein said computer is further programmed: to compute a first order sum $\sum_1(m) = \phi(m+1) + \phi(m)$ for at least one index number m ; and
when the sum $\sum_1(m)$ is not equal to at least one of the numbers +1 and -1, to adjust a value of at least said phases $\phi(m)$ and $\phi(m+1)$ so that the sum $\sum_1(m)$ is equal to one of the numbers +1 and -1.

16. The system of claim 9, wherein at least one of said selected reference signals is chosen to be an m-sequence.

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